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Abstract: This paper deals with research and development of Vehicle Monitoring and Security System which is GPS based vehicle tracking system used for security applications. It uses two main underlying concepts. These are GPS (Global Positioning System) and GSM (Global System for Mobile Communication). The main application of this system is tracking the vehicle to which the GPS is connected, giving the information about its position whenever required and for the security of each person travelling by the vehicle. This is done with the help of the GPS satellite and the GPS module attached to the vehicle which needs to be tracked. The GPS antenna present in the GPS module receives the information from the GPS satellite in NMEA (National Marine Electronics Association) format and thus it reveals the position information. This information got from the GPS antenna has to be sent to the Base station wherein it is decoded. For this GSM module is used which has an antenna too. Thus we have at the Base station; the complete data about the vehicle. Along with tracking the vehicle, the system is used for security applications as well. Each passenger/employee will have an ID of their own and will be using a remote containing key for Entry, Exit and Panic. The Panic button is used by the driver or the passenger so as to alert the concerned of emergency conditions. On pressing this button, an alarm will be activated which will help the passenger/employee in emergencies and keep them secure throughout the journey. The vehicle can also be immobilized remotely.

I. INTRODUCTION

Of all the applications of GPS, Vehicle tracking and navigational systems have brought this technology to the day-to-day life of the common man. Today GPS fitted cars, ambulances, fleets and police vehicles are common sights on the roads of developed countries. Known by many names such as Automatic Vehicle Locating System (AVLS), Vehicle Tracking and Information System (VTIS), Mobile Asset Management System (MAMS), these systems offer an effective tool for improving the operational efficiency and utilization of the vehicles.

GPS is used in the vehicles for both tracking and navigation. Tracking systems enable a base station to keep track of the vehicles without the intervention of the driver whereas navigation system helps the driver to reach the destination. Whether navigation system or tracking system, the architecture is more or less similar. The navigation system will have convenient, usually a graphic display for the driver which is not needed for the tracking system. Vehicle tracking systems combine a number of well-developed technologies.

To design Autowagon, we combined the GPS's ability to pin-point location along with the ability of the Global System for Mobile communications (GSM) to communicate with a control center in a wireless fashion. The system includes GPS-GSM modules and a base station called the control center.
In order to monitor the vehicle, it is equipped with a GPS-GSM Autowagon system. It receives GPS signals from satellites, computes the location information, and then sends it to the control center. With the vehicle location information, the control -

center displays all of the vehicle positions on an electronic map in order to easily monitor and control their routes. Besides tracking control, the control center can also maintain wireless communication with the GPS units to provide other services such as alarms, status control, and system updates.

II. RELATED TECHNOLOGY

A.   GPS Technology:
The Global Positioning System (GPS) is the only fully functional Global Navigation System (GNSS). The GPS uses a constellation of between 24 and 32 Medium Earth Orbit satellites that transmit precise microwave signals that enable GPS receivers to determine their location, speed, direction, and time. A GPS receiver receives the signals from at least three satellites to calculate distance and uses a triangulation technique to compute its two dimension (latitude and longitude) position or at least four satellites to compute its three dimension (latitude, longitude and altitude) position.

Therefore GPS is a key technology for giving device its position. GPS was enveloped by the United States Department of Defense. Its official name is NAVSTAR-GPS.

It is originally used in military services but later allowed the system available free for civilian use as a common good. Since then, GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, and scientific uses In This device we use a GPS receiver of HOLUX GR-67 series.

Fig1.GPS Receiver

GPS parameters and specifications are given below.

GPS Module	Chipset	SiRF StarIII Chipset
	Receiver type	20 channels All in view
	Sensitivity	200,000+effective correlators for fast TTFF and high sensitivity acquisitions
	Protocol format	NMEA-0183
	Start up times	Hot start: 1 S, Warm start: 38S, cold start: 42 S
	Accuracy of position	10 meters, 2D RMS
	Power requirement	3.3~5.5VDC, 50mA
	Working Temperature	-10 ℃ t + 60 ℃
	Command statements	GPGGA,GPGSA, GPRMC,GPRSV

Table-1   GPS parameters and specifications

B.   GSM Technology:

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone.GSM (Global system for mobile) uses a process called circuit switching. This method of communication allows a path to be established between two devices. Once the two devices are connected, a constant stream of digital data is relayed.GSM networks consist of thee major systems the Switching System (SS), The Base Station(BSS) and the Mobile station(MS).

II. THE SWITCHING SYSTEM

The Switching system is very operative system in which many crucial operations are conducted, SS systems holds five databases with in it which performs different functions. If we talk about major tasks of SS system it performs call processing and subscriber related functions. These databases from SS systems are HLR, MSC, VLR, AUC and EIR. The MSC in cooperation with Home Location register (HLR) and Visitor location register (VLR), take care of mobile calls and routing of phone calls. Authentication centre (AUC) is small unit which handles the security end of the system and Equipment identity register (EIR) is another important database which holds crucial information regarding mobile equipments.

III.   THE BASE STATION SYSTEM (BSS):

The base station system have very important role in mobile communication. BSS are basically outdoor units which consist of iron rods and are usually of high length. BSS are responsible for connecting subscribers (MS) to mobile networks. All the communication is made in Radio transmission. The Base station System is further divided in two systems. These two systems, they are BTS and BSC. BTS (Base Transceiver station) handles communication using radio transmission with mobile station and BSC (Base station controller) creates physical link between subscriber (MS) and BTS, then manage and controls functions of it.

IV. MOBILE STATION (SUBSCRIBER):

MS consist of a mobile unit and a smart card which is also referred as a subscriber Identity Module (SIM) card. This card fitted with the GSM Modem and gives the user more personal mobility. The equipment itself is identified by a unique number known as the International Mobile Equipment Identity (IMEI).

The GSM modem used in this device is SUNROM SIM 900D.The parameters and specification of our GSM modem is given below

GSM Module	Frequency band	Quad band 850/900/1800/1900
	Transmission power	2 W @850/ 900 MHz 1 W @800/1900MHz
	Baud rate	9600
	Power supply	12V,1A
	Operating temperature	-40 ℃ to 85 ℃

Table-2   GSM Modem parameter and specification

Fig 2: GSM Modem

V. EVALUATION OF THE STATE OF THE ART

The design takes into consideration important factors regarding both position and data communication. Thus, the project integrates location determination

(GPS) and cellular (GSM) – two distinct and powerful technologies in a single system.

Autowagon is based on a PIC microcontroller-based system equipped with a GPS receiver and a GSM Module operating in the 900 MHz band. We housed the parts in one small plastic unit, which was then mounted on the vehicle and connected to GPS and GSM antennas. The position, identity, heading, and speed are transmitted either automatically at user-defined time intervals or when a certain event occurs with an assigned message (e.g.; accident, alert, or leaving/entering an admissible geographical area).

The GPS Module outputs the vehicle location information such as longitude, latitude, direction, and Greenwich Time every five minutes. The GSM wireless communications function is based on a GSM network established in a valid region and with a valid service provider. Via the SMS provided by the GSM network, the location information and the status of the GPS-GSM VMSS are sent to the control center. Meanwhile, the Autowagon receives the control information from the control center via the same SMS. Next, the GPS-GSM Autowagon sends the information stored in the microcontroller via an RS-232 interface.There are two ways to use alarm function, which can be signified by either a buzzer or presented on LCD. The first way is to receive the command from the control center; second way is to manually send the alarm information to the control center with the push of a button.

Fig 3: communication link

The base station consists of landline modem(s) and GIS workstation. The information about the vehicle is received at a base station and is then displayed on a PC based map. Vehicle information can be viewed on electronic maps via the Internet or specialized software. Geographic Information Systems (GIS)

provides a current, spatial, visual representation of transit operations. It is a special type of computerized database management system in which geographic databases are related to one via a common set of location coordinates.

IV. STAGES OF AUTOWAGON

Stage 1
1. Driver starts his trip from the transport office.
2. AUTOWAGON transmits the Driver I.D and the Vehicle I.D along with the position of the vehicle to the base station.
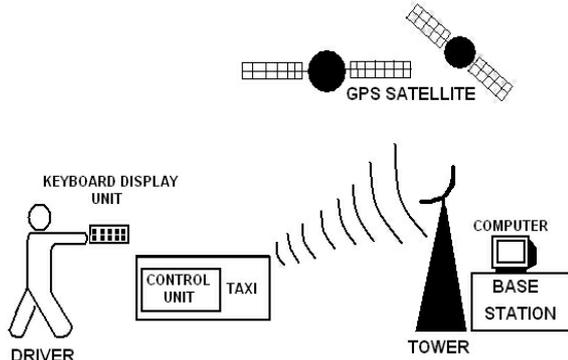

Fig .4 Communications between control unit and base station

Stage 2
1. Taxi picks up the employee/passenger from their residence.
2. Autowagon transmits the Passenger I.D and the Vehicle I.D along with the position of the vehicle to the base station. Therefore base station will be able to keep a track of the vehicle and thus the employee/passenger.
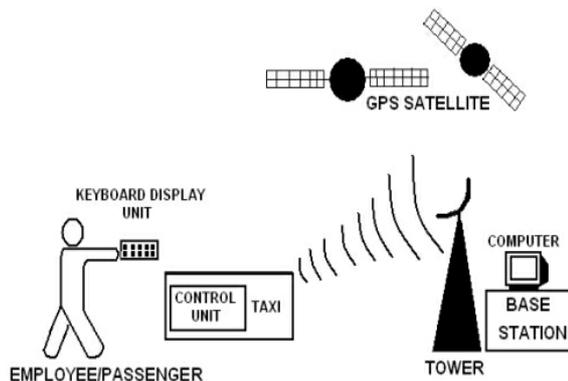

Fig .5 Communications between control unit and base station

Stage 3
1. Taxi drops the employee/passenger to the workplace.
2. Autowagon transmits the Passenger I.D and the Vehicle I.D along with the position of the vehicle to the base station.

Stage 4
1. Taxi picks the employee/passenger from the workplace.

2. Autowagon transmits the Passenger I.D and the Vehicle I.D along with the position of the vehicle to the base station. Therefore this enables the base station to estimate the time if required and also keep a track of the vehicle, passenger and the driver.

STAGE 5

1. Taxi drops the employee/passenger to their residence.
2. Autowagon transmits the Passenger I.D and the vehicle I.D along with the position of the vehicle to the base station and makes sure that the job is 100% complete./

V. SYSTEM DESCRIPTION

- The entire Autowagon System is built around the PIC 18F8722 IC. It consists of 5 units comprising of
- A Keyboard Unit
- An LCD Unit
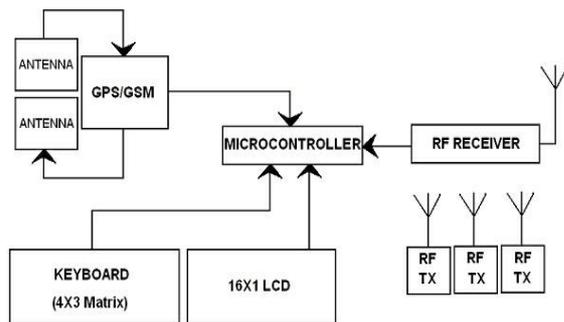- An RF Unit
- A GPS Unit
- A GSM Unit

Fig 6. Block Diagram

Each unit in the Vehicle Monitoring and Security System undertakes a specific job and can be explained as follows:

- The keyboard unit is used to type in the password and other information that needs to be keyed in.
- The LCD unit is used to display the information that is keyed into the keyboard and for other menu applications.

- The RF receiver unit is used to provide a unique code about each employee/passenger and for security applications.
- The GPS module containing the GPS antenna receives the information from the GPS satellite in NMEA format.
- The GSM module transfers the information got by the GPS receiver to the Base Station. The Base Station decodes the information to the required form.

VI. CONCLUSIONS

The outcomes of this paper will be anticipated to show that it will alert unaware drivers from preventing a traffic accident, recognizing some unusual situations or gaining more response time whenever the Emergency Vehicle was approaching. Furthermore, its commercial achievements will especially be used in ITS (intelligent Transport System). It will pre-warn the involving drivers to avoid the emergencies and accidents as soon as he encounters an Emergency Vehicle along the roadways.

VII. ACKNOWLEDGEMENTS

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